WHAT IS CLAIMED IS:

1. A CDMA receiver for receiving transmission signals transmitted from a first plurality of users and putting out message signals included in the respective transmission signals, the CDMA receiver comprising:

a second plurality of antennas;

radio portions, fed by respective antennas, for providing reception signals derived from said respective antennas;

matrix calculation means for performing a matrix calculation by using said reception signals to provide at least a common correlation matrix;

adaptive array antenna signal processing portions provided for respective users, each adaptive array antenna signal processing portion being supplied with said reception signals from said radio portions; and

detectors, provided for respective users, for detecting said message signals from output signals of said adaptive array antenna signal processing portions, wherein each of said adaptive array antenna signal processing portions comprises:

said second plurality of matched filters, each of said matched filters being configured to match a spreading code of each user to provide a despread signal;

means for calculating a weight vector by using a result of said matrix calculation;

said second plurality of multipliers for weighing said despread signals from said matched filters with respective elements of said weight vector to provide weighed despread signals; and

means for combining said weighed despread signals into one of said output signals associated with each user.

2. A CDMA receiver as defined in claim 1, wherein said matrix calculation means includes means for calculating an inverse matrix of said correlation matrix, wherein the CDMA receiver further comprises means for obtaining a response vector by using reference signals inserted in said despread signals, and wherein said means for calculating a weight vector comprises means for calculating said weight vector by using said inverse matrix and said response vector.

3. A CDMA receiver for receiving a transmission signal transmitted from each of at least one user and putting out a message signal included in the transmission signal, the CDMA receiver comprising:

a first plurality of antennas;

radio portions, fed by respective antennas, for providing reception signals derived from said respective antennas;

matrix calculation means for performing a matrix calculation by using said reception signals to provide at least a common correlation matrix;

at least one RAKE receiving portion provided for said at least one user, each RAKE receiving portion being supplied with said reception signals from said radio portions; and

one or more detector(s), provided for said at least one user, for detecting said message signal(s) from output signal(s) of said at least one RAKE receiving portion(s), wherein each of said at least one RAKE receiving portion comprises:

matched filters each being supplied with said reception signals from said radio portions and configured to match a spreading code of each user to provide a despread signal;

adaptive array antenna signal processing portions provided for a

second plurality of propagation paths of each transmission signal, each of said adaptive array antenna signal processing portions being supplied with said despread signals from said matched filters; and

means for combining signals output from said adaptive array antenna signal processing portions to provide one of said output signal(s) of said at least one RAKE receiving portion(s), wherein each of said at least one RAKE receiving portion(s) comprises:

means for calculating a weight vector adapted to one of said propagation paths by using a result of said matrix calculation;

said first plurality of multipliers for weighing said despread signals with respective elements of said weight vector to obtain weighed despread signals; and

means for combining said weighed despread signals into a transmission signal component that has passed through said one of said propagation paths.

4. A CDMA receiver as defined in claim 3, wherein said matrix calculation means includes means for calculating an inverse matrix of said correlation matrix, wherein each of said adaptive array antenna signal processing portions further comprises means for passing reference signals inserted in said despread signals through respective filters configured to match said reference signals that have passed through said one of said propagation paths to obtain a response vector, and wherein said means for calculating a weight vector comprises means for calculating said weight vector by using said inverse matrix and said response vector.

5. A CDMA receiver of receiving a transmission signal transmitted from each of a first plurality of users and putting out a message signal included

in the transmission signal, the CDMA receiver comprising:

a second plurality of antennas;

radio portions, fed by respective antennas, for providing reception signals derived from said respective antennas;

means for calculating a conversion matrix from said reception signals; and

means for converting said reception signals by using said conversion matrix to obtain respective converted signals;

adaptive array antenna signal processing portions provided for respective users, each adaptive array antenna signal processing portion being supplied with said reception signals from said radio portions; and

detectors, provided for respective users, for each detecting said message signal from an output signal of each adaptive array antenna signal processing portion, wherein each of said adaptive array antenna signal processing portions comprises:

said second plurality of matched filters configured to match a spreading code of each user to provide respective despread signals;

means for maximum-ratio combining said respective despread signals to provide said output signal of each adaptive array antenna signal processing portion.

6. A CDMA receiver as defined in claim 5, wherein said means for maximum-ratio combining said respective despread signals comprises:

means for passing reference signals inserted in said respective despread signals through respective filters configured to match said reference signals to obtain a response vector;

means for weighing said respective despread signals with said

response vector to obtain weighed despread signals; and

means for combining said weighed despread signals into said transmission signal associated with each user.

7. A CDMA receiver as defined in claim 5, wherein said means for calculating a conversion matrix comprises:

means for calculating a correlation matrix from said reception signals;

eigen-analyzing said correlation matrix to obtain eigenvalues $\{\lambda_j \mid j = 1, 2, \ldots, M\}$ and eigenvectors $\{\mathbf{e}_j \mid j = 1, 2, \ldots, M\}$, where M is a number of antennas; and

means for calculating said conversion matrix Λ, which is defined by:

$$\Lambda = \left[\frac{\mathbf{e}_1}{\sqrt{\lambda_1}} \quad \frac{\mathbf{e}_2}{\sqrt{\lambda_2}} \quad \cdots \quad \frac{\mathbf{e}_M}{\sqrt{\lambda_M}}\right]^T.$$

8. A CDMA receiver as defined in claim 7, wherein said means for converting said reception signals comprises means for calculating $\Lambda^H[x1\ x2\ \cdots\ xM]^T$ to obtain a resultant matrix whose elements consists of said respective converted signals, where x1, x2, $\cdots$, xM are said reception signals.

9. A CDMA receiver as defined in claim 5, wherein said means for maximum-ratio combining said respective despread signals includes means for performing a RAKE reception.

10. A CDMA receiver as defined in any of claims 1, 3 and 5, further comprising:

means for making a test to see if a level of a signal applied to each of said matched filters is as low as noises; and

means, responsive to an affirmative result of said test, for preventing said signal from being used subsequently.

11. A CDMA receiver as defined in claim 7, further comprising:

means for making a test to see if a level of each eigenvalue is as low as noises; and

means, responsive to an affirmative result of said test, for excluding an element derived from said low-level eigenvalue from said conversion vector.

12. A CDMA receiver as defined in claim 1 or 3, wherein said means for calculating a weight vector uses an SMI algorithm.

13. A CDMA receiver as defined in claim 1 or 3, wherein said means for calculating a weight vector uses an RLS algorithm.

14. A CDMA receiver as defined in claim 2, wherein said means for obtaining a response vector comprises means for passing said reference signals through respective filters configured to match said reference signals.

15. A CDMA receiver as defined in claim 2, wherein said means for obtaining a response vector comprises means for using said reference signals as said response vector.

16. A CDMA receiver as defined in claim 2, wherein said means for obtaining a response vector comprises:

means for detecting said despread signals in a user data transmission period other than reference signal transmission period; and

means for using said detected despread signals as said reference signals to obtain said response vector.

17. A CDMA receiver as defined in any of claims 1, 3 and 5, wherein a long code is used as said spreading code.

18. A method of extracting a transmission signal transmitted from each of a first plurality of users from reception signals derived from a second plurality of antennas constituting an antenna array in a CDMA receiver wherein the reception signals have not yet passed through respective matched filters, the method comprising:

the step of performing a matrix calculation by using said reception signals to provide at least a common correlation matrix; and the steps, executed for each user, of:

passing said reception signals through respective matched filters configured to match a spreading code of each user to obtain respective despread signals;

calculating a weight vector by using a result of said matrix calculation;

weighing said respective despread signals with said weight vector to obtain weighed despread signals; and

combining said weighed despread signals into said transmission signal associated with each user.

19. A method as defined in claim 18, wherein said matrix calculation includes calculating a inverse matrix of said correlation matrix, wherein the method further comprises the step of obtaining a response vector by using reference signals inserted in said respective despread signals, and wherein said

step of calculating a weight vector comprises the step of calculating said weight vector by using said inverse matrix and said response vector.

20. A method of extracting a transmission signal transmitted from each of at least one user from reception signals derived from a second plurality of antennas constituting an antenna array in a CDMA receiver wherein the reception signals have not yet passed through respective matched filters, the method comprising the steps of:

performing a matrix calculation by using said reception signals to provide at least a common correlation matrix; and

passing said reception signals through respective matched filters configured to match a spreading code assigned to each of said at least one user to obtain respective despread signals, the method further comprising the steps, executed for each of a plurality of propagation paths of said transmission signal, of:

calculating a weight vector adapted to one of said propagation paths by using a result of said matrix calculation;

weighing said respective despread signals with said weight vector to obtain weighed despread signals; and

combining said weighed despread signals into a transmission signal component that has passed through said one of said propagation paths, the method further comprising the step of:

combining said transmission signal components for said at least one user into said transmission signal.

21. A method as defined in claim 20, wherein said matrix calculation includes calculating a inverse matrix of said correlation matrix, wherein the

method further comprises the step of passing reference signals inserted in said respective despread signals through respective filters configured to match said reference signals that have passed through said one of said propagation paths to obtain a response vector, and wherein said step of calculating a weight vector comprises the step of calculating said weight vector by using said inverse matrix and said response vector.

22. A method of extracting a transmission signal transmitted from each of a first plurality of users from reception signals derived from a second plurality of antennas constituting an antenna array in a CDMA receiver wherein the reception signals have not yet passed through respective matched filters, the method comprising the steps of:

calculating a conversion matrix from said reception signals; and

converting said reception signals by using said conversion matrix to obtain respective converted signals, the method further comprising the steps, executed for each user, of:

passing said respective converted signals through respective matched filters configured to match a spreading code of each user to obtain respective despread signals;

maximum-ratio combining said respective despread signals into said transmission signal associated with each user.

23. A method as defined in claim 22, wherein said step of maximum-ratio combining said respective despread signals comprises the steps of:

passing reference signals inserted in said respective despread signals through respective filters configured to match said reference signals to obtain a response vector;

weighing said respective despread signals with said response vector to obtain weighed despread signals; and

combining said weighed despread signals into said transmission signal associated with each user.

24. A method as defined in claim 22, wherein said step of maximum-ratio combining said respective despread signals includes the step of performing a RAKE reception.

25. A method as defined in any of claims 18, 20 and 22, further comprising the steps of:

making a test to see if a level of a signal applied to each of said matched filters is as low as noises; and

in response to an affirmative result of said test, preventing said signal from being used subsequently.

26. A method as defined in claim 18 or 20, wherein said step of calculating a weight vector uses an SMI algorithm.

27. A method as defined in claim 18 or 20, wherein said step of calculating a weight vector uses an RLS algorithm.

28. A method as defined in claim 19, wherein said the step of obtaining a response vector comprises the step of passing said reference signals through respective filters configured to match said reference signals.

29. A method as defined in claim 19, wherein said the step of obtaining

a response vector comprises the step of using said reference signals as said response vector.

30. A method as defined in claim 19, wherein said the step of obtaining a response vector comprises the steps of:

detecting said despread signals in a user data transmission period other than reference signal transmission period; and

using said detected despread signals as said reference signals to obtain said response vector.

31. A method as defined in any of claims 18, 20 and 22, wherein a long code is used as said spreading code.